Assessing Population Status with DNA:

No reliable information currently exists on grizzly, black bear, or lynx population status in Glacier National Park or the surrounding ecosystem. Recent advances in genetic technology allow identification of species, sex, and individuals from DNA extracted from hair and feces without handling animals. DNA is analyzed from bear sign collected along established trails and from a grid of systematically positioned hair traps. This information is used to estimate bear population density in a 2 million acre area and develop non-invasive population trend monitoring protocols. A pilot study to develop these techniques for lynx will be launched in 2000. This project is a collaborative effort involving 14 national, state, provincial, tribal, university and private entities in the U.S. and Canada.

Contact: katherine_kendall@usgs.gov.

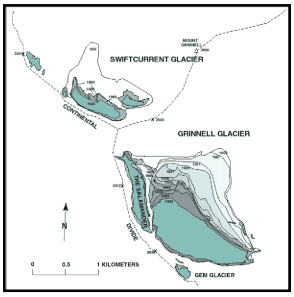
Alpine Tundra and Treeline Ecotone Studies:

These projects seek a better understanding of ecosystem processes in Glacier National Park at and above treeline where responses to climatic shifts may be most evident. Digital aerial photography demonstrated changes in "krummholz" (low-lying trees) spatial patterns over the past 70 years. Krummholz patches have expanded and merged and many low-lying trees have begun growing more upright. Our collaborators at 5 universities have formed a multidisciplinary team to examine spatio-temporal patterns of tree invasion into alpine tundra. Studies include spatial simulation models of seedling establishment with differing feedback strengths, micrometeorological controls of patch shape, spatial scaling studies, and the role of fossorial rodents in alpine vegetation patterns. We also are participating in a global observation network for alpine sites, and several other international initiatives, to contrast Glacier's changes to those elsewhere on the planet.

Contact: dan_fagre@usgs.gov.

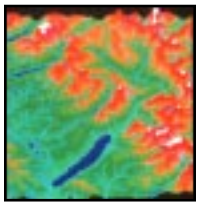
Glacier Retreat in Glacier National Park:

Glacier National Park encompasses a number of alpine glaciers exhibiting pronounced shrinkage from sizes attained 150 years ago, at the end of the so-called Little Ice Age. The Mountain Landscape Ecology project and the Global Change program, together with the National Park Service and other collaborators, have begun to measure and analyze these changes in hopes of understanding long-term trends, forcing mechanisms, and future ecosystem responses. A variety of remote sensing and ground-based technologies have been applied, drawing upon many data sources. Products, such as GIS time-series models, have generated notable public interest, and demonstrate the value of this particular assemblage of alpine glaciers in studying a phenomena occurring throughout the Rocky Mountains and much of the world.



Contact: carl_key@usgs.gov

Global Change Research Program:



This group of interrelated projects is focused on responses to climatic variability of the Crown of the Continent Ecosystem, which encompasses Glacier National Park and surrounding natural landscapes in Montana and Canada along the Continental Divide. Through ecosystem modeling and extensive field studies, we provide spatially-explicit knowledge of the underlying dynamics of mountain ecosystems such as limiting factors for tree growth or water temperature controls on stream biota. With collaborators from 5 universities and 4 federal agencies, we are (1) comparing mountain ecosystem responses to disturbance and climatic change in the Olympic Mountains and North Cascades to those in the Northern Rocky Mountains, (2) examining the potential impacts of atmospheric stressors and altered snowpack chemistry to soil and plant communities, (3) defining the role of UVB radiation in amphibian metapopulation dynamics, and (4) investigating responses of floodplain biota to altered thermal regimes. Ongoing studies of snow, mountain climatology, glaciers and lake-ice, and the use of repeat photography, collectively document ecosystem changes of the past and refine projections for the future.

Contact: dan_fagre@usgs.gov.

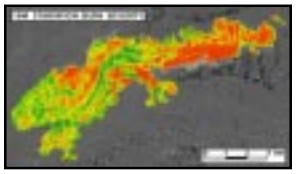
Whitebark and Limber Pine Decline and Status:

Whitebark pine, a keystone species of subalpine forests, has suffered catastrophic declines from fire exclusion and an exotic fungus, white pine blister rust. Very little is known about limber pine. The status of whitebark and limber pine in national parks in the Rocky Mountains from Wyoming to Alberta and the historical distribution of these pines in Glacier National Park, Montana was assessed during 1995-97. Information on tree status and the effect of damaging agents in 316 subalpine forest stands is being used to validate remote sensing-based classifications of the level of damage. Mortality exceeds 40% in many regions and up to 90% of the remaining trees are infected with blister rust and will eventually die. Information learned is being used to guide restoration efforts and further research.

Contact: katherine_kendall@usgs.gov.

Remote Sensing of Burn Severity on National Park Service Lands:

A range of issues compels thorough analysis of fire events and knowledge of environmental responses in fire impacted areas. Yet, required levels of information are difficult to obtain, especially where fire size, remoteness and rugged terrain impede direct observation of burned areas. The Mountain Landscape Ecology project has made significant progress in two areas contributing to successful quantification and mapping of burn severity. One is the ecological definition of severity and development of a standard, transferable field methodology to measure it. The other is a new remote sensing index derived from Landsat TM data that appears to provide accurate, repeatable detection of burn severity. The approach has potential for national implementation. It will be tested further in several National Parks beginning in 2000 to evaluate performance in a variety of ecosystems.



Contact: carl_key@usgs.gov